ROCKY FLATS PLANT, CHEMICAL ANALYTICAL LABORATORY
(Building 559)
North-central section of the Plant
Golden vicinity
Jefferson County
Colorado

HAER No. CO-83-AH

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
1849 C St. NW
Washington, DC 20240

HAER
COLO
30-GOLD.V
1AH-

HISTORIC AMERICAN ENGINEERING RECORD

ROCKY FLATS PLANT,
CHEMICAL ANALYTICAL LABORATORY HAER No. CO-83-AH
(Rocky Flats Plant, Building 559)

Location: Rocky Flats Environmental Technology Site, Highway 93, Golden, Jefferson County, Colorado. Building 559 is located in the north-central section of the Rocky Flats Plant (Plant).

Significance: Building 559 is a secondary contributor to the Rocky Flats Plant historic district, associated with the United States strategy of nuclear military deterrence during the Cold War, a strategy considered of major importance in preventing Soviet nuclear attack. Building 559, the Chemical Analytical Laboratory, was a plutonium analytical laboratory that served both Plant production and support operations. Samples of recovered, cast, and purified materials from the Plant were analyzed in the lab. The building contained laboratory facilities for conducting spectrochemical, chemical, and mass spectrometric analyses.

Description: Building 559 is a one-story, rectangular-shaped complex containing over 32,600 square feet of floor space. The footprint of the structure measures approximately 240' x 120'. Building 559 is constructed of concrete columns erected on concrete footings. Exterior walls between the columns consist of two thicknesses of unreinforced concrete block. Most of the interior walls are concrete block. The floors are poured concrete, covered with a polyurethane/plastic finish, quarry tile, or vinyl-asbestos tile. The roof is flat and contains pre-stressed single- and double-tee concrete slabs supported by reinforced concrete beams. Small wings extend from the northeast and southwest sides of the structure, forming a rectangular outline. Doors in the laboratory complex are metal. The only exterior windows are located in Room 136, the lunchroom. Interior windows have pressed metal frames with laminated safety glass panes. Later additions to the building include loading docks and ramps, a storeroom, a locker room, a lunch room, an entryway, a receiving and storage area, additional laboratory space, excavation of a waste holding pit, and an underground corridor.

Physical barriers and zones are present to confine the movement and transportation of radioactive materials within the building. The ventilation system created a negative air pressure differential from zones of no radioactivity toward areas of potentially higher radioactivity. Differential pressure sensing instruments maintained the air pressure balance between zones. The outside shell of the laboratory provided additional containment; double-door airlocks are present between passageways. Glove boxes in Building 559 are constructed of stainless steel or carbon steel and lined with Teflon®. Most of the glove box and conveyor line windows contain 0.25" safety glass. Where possible, gloveboxes are designed with a single-level floor. The building is a non-reactor nuclear facility.

Associated buildings within the Building 559 complex include:

- Building 561, the Filter Plenum, was built in 1973 to house the exhaust plenums for the laboratory building. It is connected to Building 559 via underground corridors containing ventilation exhaust ducts. The underground corridor is approximately 26' long and is constructed of multi-plate steel;
- Building 562 was built in 1973. It is a one-story, cement block structure located east of Building 561 and houses the emergency generator for Building 561;
- Buildings 560 and 563, built in 1967 and 1983, respectively, are cooling towers constructed of reinforced concrete; and
- Building 528 is an underground waste holding pit containing two 2,000-gallon tanks that collect waste liquids from Buildings 559 and 561 for subsequent transfer to the waste treatment facility.

History: The plutonium laboratory was constructed in 1967, and first began operations in January 1968. Samples of recovered, cast, and purified materials from the Plant were analyzed in the lab. The building contained laboratory facilities for conducting spectrochemical, chemical, and mass spectrometric analyses. In 1973, the construction of Building 561 expanded the capabilities of the laboratory. Support tasks in Building 559 included primary analytical support for Building 707 production contingency; Raschig Ring analysis and certification; duct remediation; analysis and characterization of low-level waste; and analysis of contaminated polychlorinated biphenyls. Later projects included the Waste Isolation Pilot Project Bin and Alcove test program; the Waste Stream and Residue Identification and Characterization program; and consolidation and stabilization of nuclear materials.

Operations: For administrative purposes, there were two analytical laboratories present in the structure. The production support and plant support laboratories shared equipment and space. The area along the north side of the building was divided into rooms for offices, radiation monitoring, a computer room, restrooms, a locker room, storerooms, and maintenance equipment. Four large areas along the south side and east end of the building were used for mechanical equipment and laboratories. Specific laboratories included the spectrochemical analysis laboratory (Room 101), the chemistry laboratory (Room 102), and the mass spectroscopy laboratory (Room 103). Radioactive materials processed in the laboratories were received and shipped from a loading dock on the south side of the building. A second loading dock at the west end was used to receive building supplies.

In the production support laboratory, quantitative and qualitative chemical analyses for plutonium production operations were performed to ensure raw material used in manufacturing processes were within specifications, that the various processes on the Plant produced materials that met specifications, and that the final products conformed to requirements. Quantitative analyses included: gallium in plutonium alloy, plutonium assay, carbon-hydrogen-nitrogen contents, ion analysis, tritium content, emission spectrometric analysis, atomic absorption, coulometric analysis, x-ray fluorescence spectroscopy, and identification of various isotopes.

Samples consisted primarily of plutonium or other metals and their alloys, oxides of plutonium, uranium, solutions of plutonium or other elements, and various gases. Materials in process were held at given stages in their sequence of operations until results of sample analyses were obtained and verified. Small samples of solids or liquids were transferred from production areas to the laboratories, where exact sample aliquots were prepared from the production sample. These samples were transferred to appropriate instruments for analysis.

The plant support laboratory personnel performed analyses on materials from Plant support functions indirectly related to production activities (e.g., radiation monitoring and waste treatment). This group performed mass spectrometry analyses of isotopes of plutonium, uranium, lithium, and boron (thermal ionization); of organic compounds; of gases; of operational processes; and using spark ionization. Other analyses included infrared analysis to determine impurities; thermal characterization analysis to determine changes in phase as a function of temperature; and Karl Fischer titrimetry to determine water content of organic solvents.

Sources: Colorado Department of Health. *Project Tasks 3 & 4 Final Draft Report. Reconstruction of Historical Rocky Flats Operations and Identification of Release Points (1992),* by ChemRisk. Rocky Flats Repository. Golden, Colorado.

United States Department of Energy. *Historical Release Report (HRR) (1994),* by EG&G. Rocky Flats Plant Repository. Golden, Colorado, 1994.

United States Department of Energy. *Final Cultural Resources Survey Report (1995),* by Science Applications International Corporation. Rocky Flats Repository. Golden, Colorado, 1995.

Historians: D. Jayne Aaron, Environmental Designer, engineering-environmental Management, Inc. (e^2M), 1997. Judith Berryman, Ph.D., Archaeologist, e^2M, 1997.